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MINERAL INVESTIGATION OF THE SAND DUNES WILDERNESS STUDY AREA SWEETWATER COUNTY, WYOMING

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This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. Work on this study was conducted by personnel from the Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Area

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of the Sand Dunes Wilderness Study Area (WY-040-307), Sweetwater County, Wyoming.

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MINERAL INVESTIGATION OF THE SAND DUNES WILDERNESS STUDY AREA SWEETWATER COUNTY, WYOMING

By

George S. Ryan, Bureau of Mines

SUMMARY

There is no evidence of past mining activity in the 16,280 acre Sand Dunes Wilderness Study Area situated in the Killpecker Creek Valley in southwestern Wyoming. Natural gas may exist there; however, no wells have been drilled to verify its presence. Eight wells, drilled within 1.5 mi of the eastern and southern boundaries, in geologically equivalent rocks to those in the study area, had initial gas production ranging from 278 thousand to 638 thousand cubic feet of gas per day. Coal was mined, for local use, 1.5 mi to the southeast but no coal outcrops were noted in the study area. Geophysical data indicate coal seams in nearby drill holes and coal resources may occur within the study area. There is no information for shallow coal; the indications of coal seams in the geophysical logs of the gas wells are at depths that preclude economic mining. Dune sand may be suitable for some construction purposes, but low silica and high iron content prevent its use as glass sand or other special purpose sands. Two clay and shale units in the area are marginally suitable for the manufacture of structural clay products.

INTRODUCTION

In 1984, the Bureau of Mines, in conjunction with the U.S. Geological Survey (USGS), studied the mineral resources of the Sand Dunes Wilderness Study Area (WSA), Sweetwater County, Wyoming, on lands administered by the Bureau of Land Management (BLM). Bureau personnel investigated mineral occurrences to determine the presence of mineral reserves and subeconomic resources. The USGS assessed the potential for undiscovered mineral resources

based on regional geological, geochemical, and geophysical surveys. This report presents the results of the Bureau of Mines study.

Geographic and geologic setting

The Sand Dunes WSA, comprising 16,280 acres of BLM land in north-central Sweetwater County, Wyoming, is about 30 mi north of Rock Springs, Wyoming and about 12 mi east of Eden, Wyoming. Access is provided by several improved and unimproved dirt roads leading east from U.S. Route 191 and south from State Route 28 (fig. 1). The area is typified by active sand dunes and ponded water in the lower elevations, and vegetation-stabilized dunes and exposed bedrock at higher elevations. The active dune fields consist of a sequence of dome transverse, barchan, and parabolic dunes--all characteristic of unidirectional winds (Albrandt, 1973, p. 127). Topographic relief is generally moderate with steeper slopes adjoining west-trending valleys. Elevations in the WSA range from about 6,720 ft near the southeastern corner to 7,769 ft along the eastern boundary.

The Sand Dunes WSA lies mainly within the Green River Basin drainage, and on the northwestern part of the Rock Springs Uplift. Bedrock consists of Eocene lacustrine and fluviatile sediments of the Wasatch and Green River Formations. The rocks dip northwest, away from the Rock Springs Uplift. Much of the bedrock is covered by Quaternary eolian deposits that developed within the past 20,000 years during glacial interstades.

Extensive coal deposits in Wyoming are present in large depositional basins. The characteristics of such deposits are important in understanding the likelihood for coal in the study area. Averitt (1975, p. 7 and 15) reports that one trillion tons of coal underlie 41 percent of Wyoming. The Powder River coal basin covers more than 12,000 sq mi of northeastern Wyoming

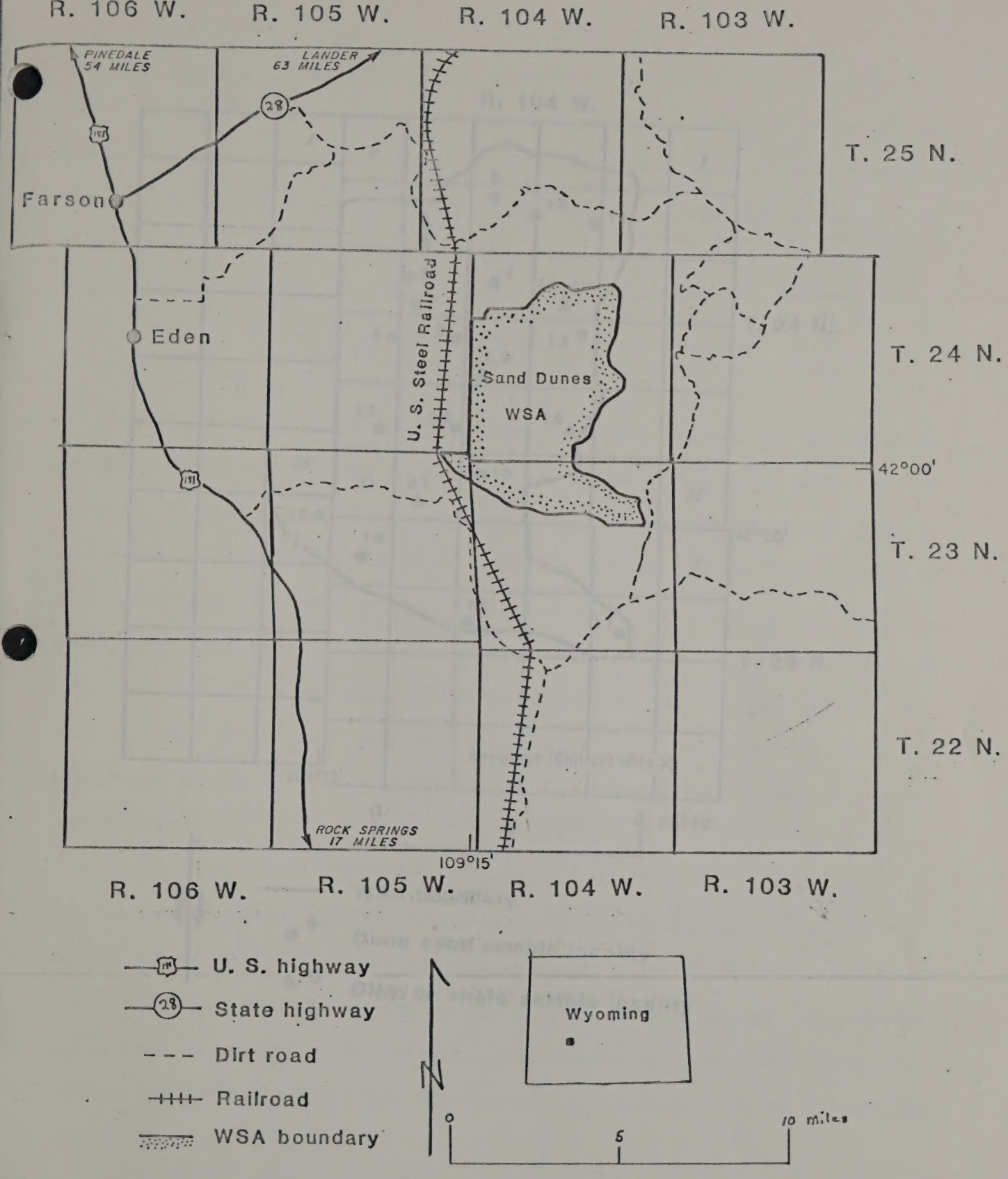


Figure 1.--Index map of the Sand Dunes Wilderness Study Area.

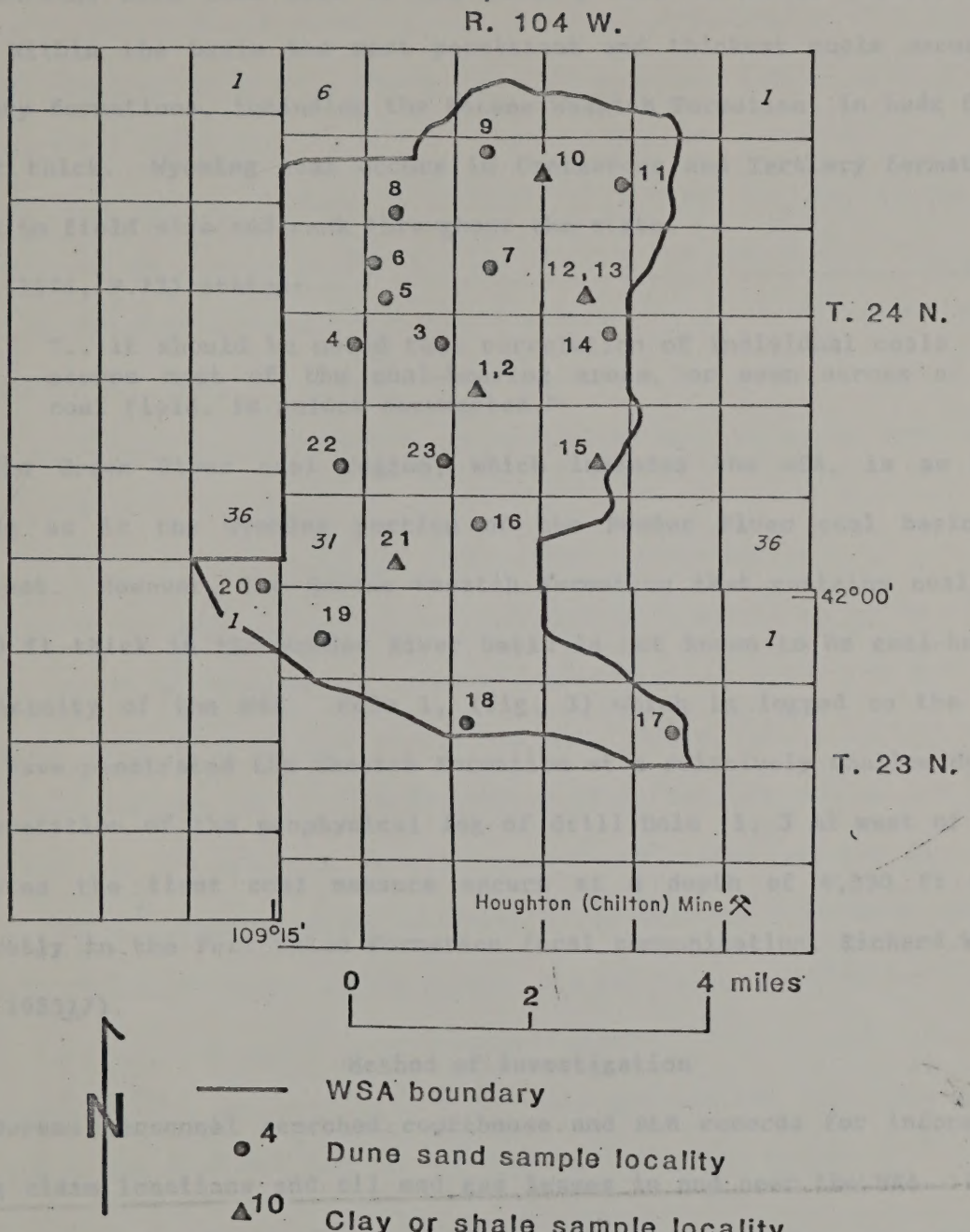
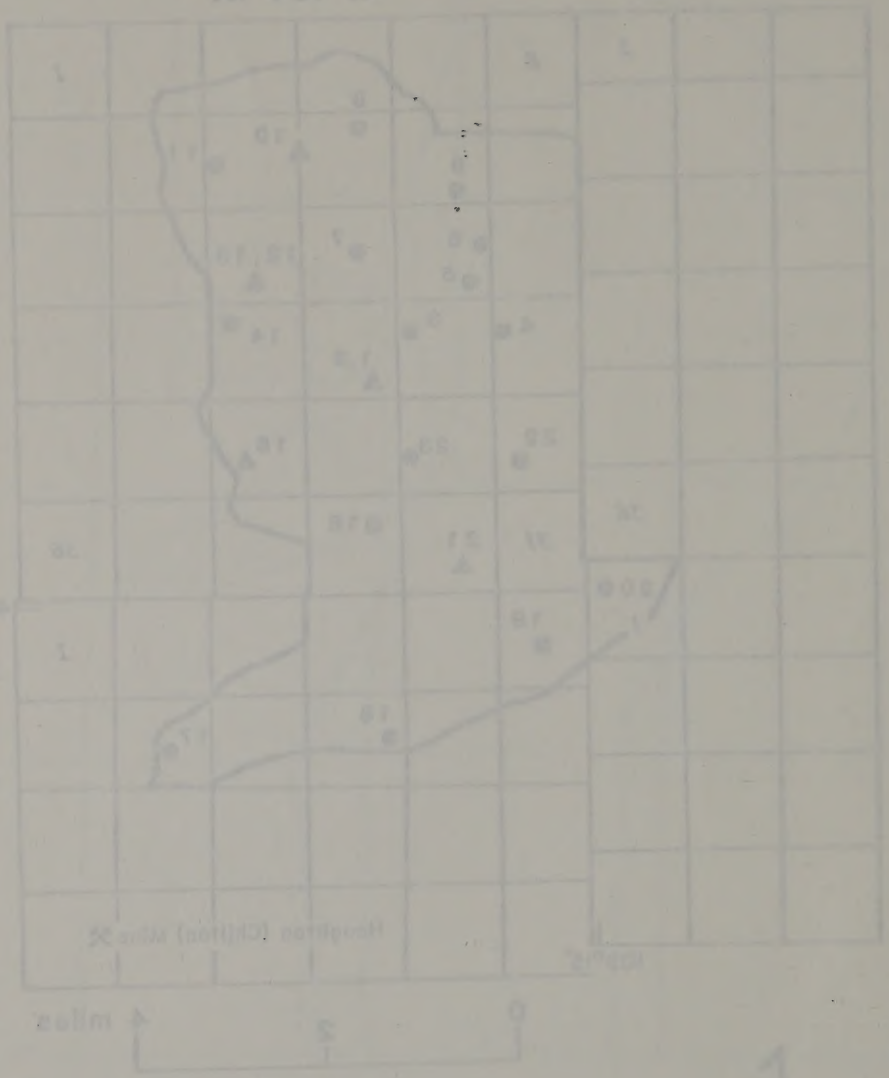


Figure 2.--Map of sample localities in the Sand Dunes Wilderness Study Area.



and contains more than half of the state's coal resources (Glass, 1976, p. 74). Within the basin the most persistent and thickest coals occur in two Tertiary formations, including the Eocene Wasatch Formation, in beds from 8 to 220 ft thick. Wyoming coal occurs in Cretaceous and Tertiary formations and varies in field size and rank throughout the state.

Glass (1976, P.73) states:

> "...it should be noted that correlation of individual coals across most of the coal-bearing areas, or even across a coal field, is seldom documented."

The Green River coal region, which includes the WSA, is as large in Wyoming as is the Wyoming portion of the Powder River coal basin to the northeast. However, the Eocene Wasatch Formation that contains coal beds up to 220 ft thick in the Powder River basin is not known to be coal-bearing in the vicinity of the WSA. Hole 1, (fig. 3) which is logged to the surface, would have penetrated the Wasatch Formation at a relatively shallow depth. An interpretation of the geophysical log of drill hole 1, 3 mi west of the WSA, indicates the first coal measure occurs at a depth of 4,330 ft which is apparently in the Fort Union Formation (oral communication, Richard W. Jones, March 1985[1/]).

Method of investigation

Bureau personnel searched courthouse and BLM records for information on mining claim locations and oil and gas leases in and near the WSA. Published and unpublished literature was reviewed for information on any mineral occurrences and mining activity in the area. Geophysical logs from nearby oil and gas exploration drill holes were used to determine depths and thicknesses of coalbeds.

1/ Staff Coal Geologist, Wyoming Geological Survey.

During the field investigation, 16 dune sand, 5 clay, and 2 shale samples were collected at sites shown on fig. 2. Dune sand samples were analyzed for certain elements by atomic absorption (table 1) and for 40 elements by semi quantitative optical emission spectrographic methods. Grain-size distributions (table 2) were determined to evaluate the suitability of dune sand for use in various products. Slow-firing and preliminary bloating tests (table 3) of clay and shale determined suitability of their use for structural clay products. Complete analyses are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Denver Federal Center, Denver, Colorado 80225.

Oil and gas exploration and production

All of the Sand Dunes WSA and surrounding area is covered by oil and gas leases. Surface evidence of seismic exploration is extensive but no oil or gas wells have been drilled within the WSA. Eight wells, drilled within 1.5 mi of the southern and eastern boundaries (fig. 3), had initial gas production rates between 278 thousand to 638 thousand cubic feet gas per day (table 4). Six of these producing wells are within the Nitchie Gulch/Pine Canyon Known Geologic Structure (KGS), which adjoins the WSA on the southeast.

Acknowledgments

Certain coal information and gas well geophysical logs were provided by Dick Jones and Alan Verploeg of the Wyoming Geological Survey.

MINERAL COMMODITIES

Mineral commodities in the Sand Dunes WSA include: sand, clay, and shale. Natural gas and coal may be present subsurface.

Sand

Abundant quantities of sand overlie bedrock in the Sand Dunes WSA. Chemical analyses (table 1) indicate that this sand contains insufficient

During the field investigation, 36 dune sand, 5 clay, and 2 shale samples were collected at sites shown on fig. 2. Dune sand samples were analyzed for constituents present by atomic absorption (table 1) and for 40 elements by semi-quantitative optical emission spectrographic methods. Grain-size distributions (table 2) were determined to evaluate the suitability of dune sand for use in various products. Slow-firing and preliminary bloating tests (table 3) of clay and shale determined suitability of shale use for structural clay products. Complete analyses are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Federal Center, Denver, Colorado 80225.

Oil and gas exploration and production

All of the Sand Dunes USA and surrounding area is covered by oil and gas leases. Surface evidence of seismic exploration is extensive but no oil or gas wells have been drilled within the USA. Eight wells, drilled within 1.5 mi of the southern and eastern boundaries (fig. 3), had initial gas production rates between 218 thousand to 838 thousand cubic feet gas per day (table 4). Six of these producing wells are within the Mobile Oil/Pine Canyon Geologic Structure (PCS), which adjoins the USA on the southeast.

Acknowledgments

Certain coal information and gas well geophysical logs were provided by Dick Jones and Stan Verplank of the Wyoming Geological Survey.

MINERAL COMMODITIES

Mineral commodities in the Sand Dunes USA include sand, clay, and shale. Natural gas and coal may be present subsurface.

Sand

Abundant quantities of sand overlie bedrock in the Sand Dunes USA. Chemical analyses (table 1) indicate that this sand contains impurities

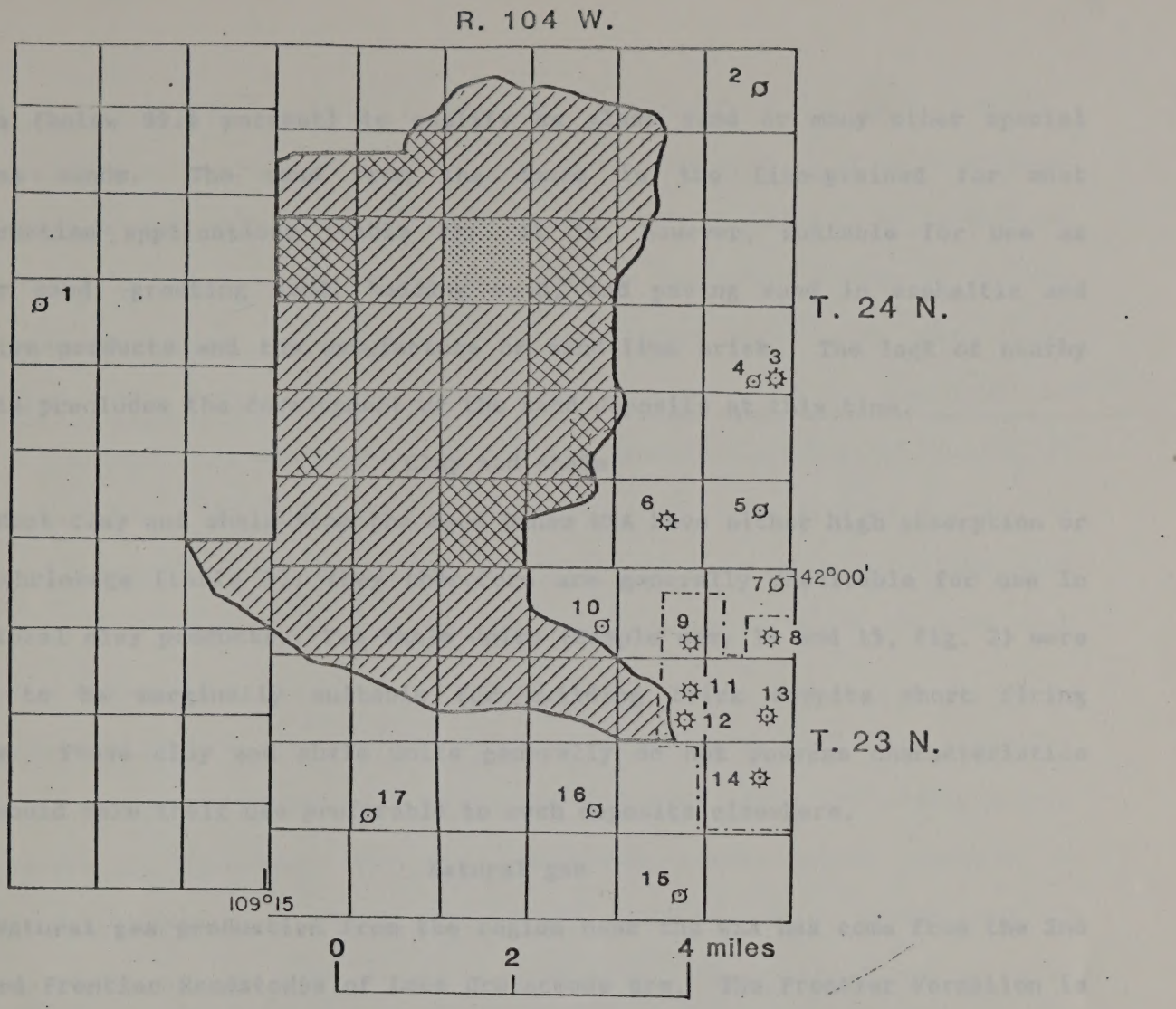
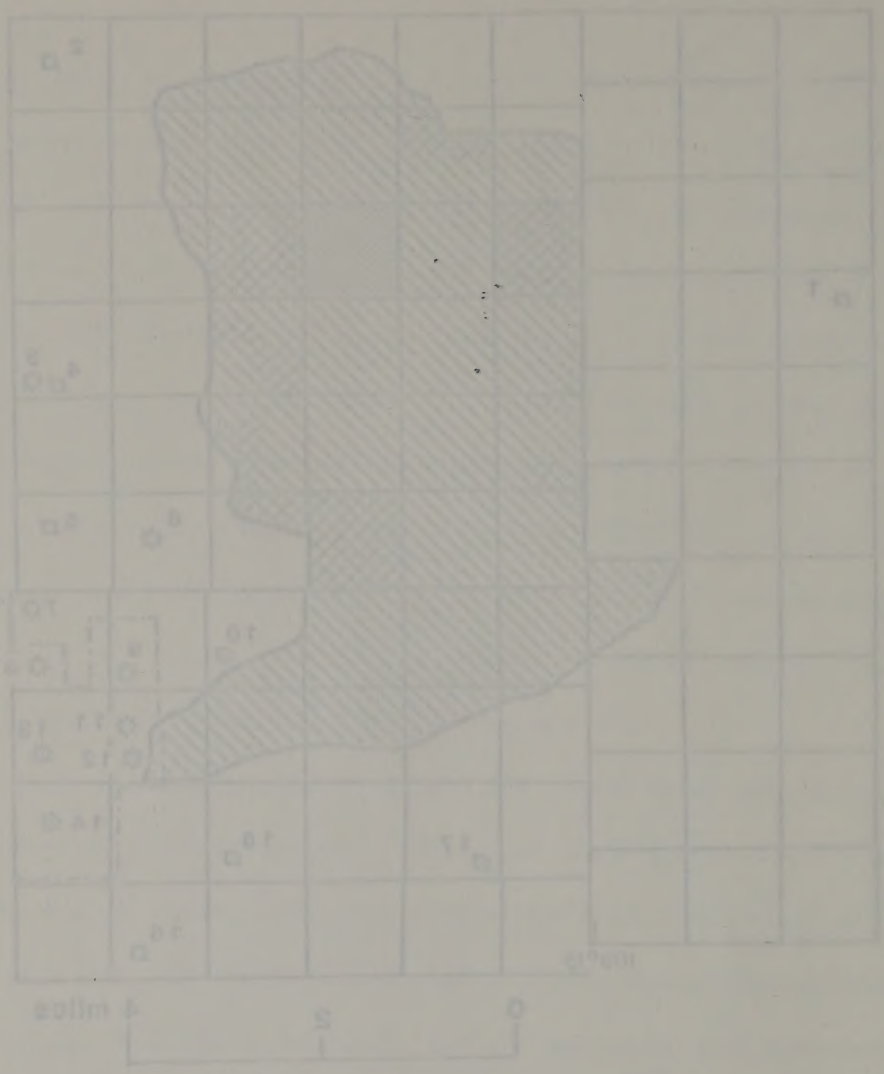


Figure 3.--Map showing oil and gas wells and land status in the vicinity of the Sand Dunes Wilderness Study Area.



silica (below 99.4 percent) to qualify as glass sand or many other special purpose sands. The sand from the dunes is too fine-grained for most construction applications (table 2). It is, however, suitable for use as mortar sand, grouting sand, bedding sand, and paving sand in asphaltic and abrasive products and the manufacture of sand-lime brick. The lack of nearby markets precludes the development of the sand deposits at this time.

Clay and shale

Most clay and shale from the Sand Dunes WSA have either high absorption or high shrinkage (table 3); they therefore are generally unsuitable for use in structural clay products. Two shale units (Sample nos. 13 and 15, fig. 2) were found to be marginally suitable for building brick despite short firing ranges. These clay and shale units generally do not possess characteristics that would make their use preferable to such deposits elsewhere.

Natural gas

Natural gas production from the region near the WSA has come from the 2nd and 3rd Frontier Sandstones of Late Cretaceous age. The Frontier Formation is seen in logs of drill holes east and west of the WSA and therefore can be presumed to underlie the WSA. The formation is composed of delta-front and delta-plain sediments overlain by a barrier-offshore bar sequence formed by the reworking of deltaic sediments (Finley and others, 1983, p.273). Based upon the southeastward progradation of the Frontier Formation delta, sandstones that produce gas in the Nitchie Gulch/Pine Canyon KGS would be expected to extend northwestward into the WSA.

Coal

No coal exposures were located within the WSA. However, coal has been produced from the Tertiary Fort Union Formation at the Houghton (Chilton) Mine

(fig. 2), about 1.5 mi southeast of the WSA. The mined coalbed is 8 ft thick, consisting of a 3-ft lower and a 5-ft upper seam. The coal is of subbituminous rank with low ash and sulfur content (Lord, 1913, p. 316). No production records for this mine are available, but based on the size and type of surface facilities production is believed to have been minor and for local consumption. The Fort Union Formation strikes north-south at the mine and could be the same coal bed that crops out near gas well 6 (fig. 3) about 1 mi east of the WSA. The regional dip, because of the Rock Springs Uplift, is between 5° and 8° to the northwest and this coal seam dips under the sand dunes. The 3-ft seam noted near the gas well appears to be of low rank with numerous clay partings.

Holes drilled for gas and oil exploration in areas with deep potential reservoirs are not attended by a geologist or logged above the casing point, which generally is around 1000 ft. Therefore, there are no geologic or electric logs available above that depth and no valid assumptions or presumptions of shallow coal ledges can be made. Geophysical logs of drill holes within 2 mi east and south of the WSA indicate the presence of up to 20 coal seams with thicknesses of 3 ft to 20 ft down to a depth of 5,000 ft. The log of the 7,833 ft deep drill hole 1, west of the WSA, indicates the presence of 15 coal seams ranging in thickness from 2 ft to 45 ft for a cumulative total of 213 ft of coal of unknown rank. A 32-ft bed was noted at 5,845 ft and the 45-ft bed at 6,800 ft. The nature of the coal occurrences in the Green River coal basin prevents correlation over any distance without drill hole control and there are no drill holes in the WSA. It is possible that specially designed high-density seismic surveys could delineate the lateral extent of the thicker beds, even at the depths indicated in hole 1.

Although coal is presumed to underlie portions of the Sand Dunes WSA it is of unknown quality, thickness, and depth. Any development of the coal would depend on these three factors.

The maximum depth for open pit coal mines is generally about 200 ft. The presence of extensive coal beds with a maximum stripping ratio of up to 15/1 in large areas of Wyoming would preclude open pit development and production because of present and probable future high costs. In situ mining (in-place gasification) is considered practical only in beds at least 20 ft thick; but burns of multiple, thinner, seams are presently in the testing stage.

CONCLUSIONS

Sand, clay, and shale crop out within the WSA. They are generally of low quality but suitable for use in some building products. The local market for such products is small. Existing sources nearer to markets are capable of supplying anticipated demand.

Formations containing oil and gas outside the study area are also present in the southeastern and eastern part of the Sand Dunes WSA. Primary drilling targets in the region are delta-plain and delta-front sandstones of the Cretaceous Frontier Formation (the 2nd and 3rd Frontier sandstones) which probably underlie the area. Sandstones that produce gas in the Nitchie Gulch/Pine Canyon KGS would be expected to extend northwestward into the WSA.

Coal has been mined within 1.5 mi of the study area but there are no coal outcroppings in the WSA. Coal of unknown rank and quality is inferred to underlie portions of the WSA but based on the interpretation of geophysical logs in drill holes outside the study area it may be at depths that make mining impractical at present.

Table 1.--Chemical analysis of dune sand samples from the Sand Dunes Wilderness Study Area, Wyoming

Sample Number (see fig. 2)	SiO_2	Fe_2O_3	Al_2O_3	CaO	K_2O	MgO	Na_2O	TiO_2	P_2O_5
	Percent								ppm
3	74.9	1.50	14.0	3.6	1.6	0.47	1.9	0.27	370
4	79.4	.89	12.2	2.6	1.6	.27	1.6	.14	390
5	77.0	1.10	13.5	3.2	1.5	.36	1.8	.19	410
6	79.3	.79	12.5	2.5	1.5	.23	1.6	.13	280
7	78.2	1.00	12.9	2.6	1.8	.31	1.8	.17	290
8	80.4	.72	12.2	2.3	1.6	.20	1.6	.12	200
9	80.3	.82	13.3	2.3	1.6	.23	1.7	.16	370
11	79.8	.78	13.0	2.1	1.6	.23	1.7	.14	320
14	78.2	1.10	12.9	2.7	1.7	.30	1.7	.16	300
16	80.0	.90	11.7	2.4	1.8	.29	1.6	.14	260
17	78.2	1.20	12.7	3.0	1.5	.42	1.6	.23	230
18	78.4	1.30	11.9	2.8	1.4	.42	1.5	.24	330
19	78.8	1.30	11.6	2.8	1.6	.42	1.5	.23	320
20	79.5	1.10	11.7	2.5	1.7	.31	1.5	.18	340
22	79.1	.96	12.2	2.6	1.6	.29	1.6	.16	220
23	79.9	.82	12.4	2.5	1.7	.24	1.6	.15	130

Table 2.--Grain-size analysis of dune sand samples from the Sand Dunes Wilderness Study Area, Wyoming

Sample Number (see fig. 2)	Grain-Size Distribution1/						
	+10 mesh	10 to 16 mesh	16 to 35 mesh	35 to 60 mesh	60 to 120 mesh	120 to 230 mesh	-230 mesh
	(weight percent)						
3	2.6	<0.1	<0.1	19.2	77.9	0.1	0.1
4	<0.1	< .1	8.6	60.5	30.8	.1	.1
5	< .1	< .1	.2	45.0	54.8	<.1	<.1
6	< .1	< .1	1.4	68.0	30.6	<.1	<.1
7	< .1	< .1	.7	55.0	44.1	.1	.1
8	< .1	< .1	2.7	63.9	33.3	.1	.1
9	< .1	< .1	1.2	42.1	56.7	<.1	<.1
11	< .1	< .1	3.5	50.9	45.3	.2	.2
14	< .1	< .1	3.3	66.4	30.3	.1	.1
16	< .1	< .1	16.1	51.3	32.3	.1	.1
17	< .1	< .1	1.4	26.6	72.0	.1	<.1
18	< .1	.1	14.6	21.6	62.8	.6	.3
19	< .2	.4	21.2	35.5	42.2	.4	.1
20	< .1	< .1	13.1	48.5	38.3	<.1	<.1
22	< .1	< .1	5.3	36.5	58.3	<.1	<.1
23	< .1	< .1	2.5	51.8	45.6	<.1	<.1

1/ U.S. Standard Sieves

Table 3.--Results of slow-firing and preliminary bloating tests of clay and shale samples from the Sand Dunes Wilderness Study Area, Wyoming

Sample Number 1
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 24.3 Working Properties Plastic Color Gray
Drying Shrinkage, Percent 2.5 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	5 YR 8/4	3	5.0	28.2	44.4	1.57
1,050	5 YR 8/4	3	5.0	27.0	42.5	1.57
1,100	5 YR 6/4	4	15.0	8.9	18.6	2.08
1,150	-	-	Melted	-	-	-
1,200	-	-	-	-	-	-
1,250	-	-	-	-	-	-

pH 8.1 HCL Effervescence None Other Tests --

Preliminary Bloating Test: Negative

Sample Number 2
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 28.8 Working Properties Plastic Color Brown
Drying Shrinkage, Percent 2.5 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	5 YR 7/6	3	7.5	27.3	42.6	1.56
1.050	5 YR 7/6	3	7.5	26.2	41.2	1.57
1,100	2.5 YR 4/6	4	15.0	11.8	23.0	1.95
1,150	-	-	Melted	-	-	-
1,200	-	-	-	-	-	-
1,250	-	-	-	-	-	-

pH 8.1 HCL Effervescence None Other Tests --

Preliminary Bloating Test: Negative

Sample Number 10
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 22.5 Working Properties Plastic Color Tan
Drying Shrinkage, Percent 2.5 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	5 YR 8/2	3	5.0	34.8	49.4	1.42
1,050	5 YR 8/2	3	5.0	33.7	48.6	1.44
1,100	10 YR 9/2	3	5.0	32.7	47.7	1.46
1,150	2.5 Y 8/4	4	7.5	25.5	41.4	1.62
1,200	5 Y 7/6	6	15.0	12.3	25.5	2.07
1,250	-	-	Melted	-	-	-

pH 8.3 HCL Effervescence None Other Tests --

Preliminary Bloating Test: Negative

Sample Number 12
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 23.0 Working Properties Plastic Color Gray
Drying Shrinkage, Percent 5.0 Dry Strength Good
Slow Firing Test:

Temp ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	5 YR 7/6	3	5.0	22.4	37.8	1.69
1,050	5 YR 7/6	3	5.0	22.3	37.6	1.68
1,100	5 YR 6/6	3	5.0	19.3	33.9	1.76
1,150	5 YR 5/2	4	12.5	2.7	5.9	2.18
1,200	-	-	Melted	-	-	-
1,250	-	-	-	-	-	-

pH 7.8 HCL Effervescence None Other Tests --

Preliminary Bloating Test: Negative

Table 3.- Results of slow-firing and preliminary bloating tests of clay and shale samples from the Sand Dunes Wilderness Study Area, Wyoming--Continued

Sample Number 13
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 25.1 Working Properties Plastic Color Brown
Drying Shrinkage, Percent 5.0 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	2.5 YR 6/8	3	7.5	21.8	37.4	1.71
1,050	2.5 YR 6/6	4	7.5	21.7	37.4	1.72
1,100	2.5 YR 5/6	4	10.0	18.7	33.4	1.78
1,150	-	-	Melted	-	-	-
1,200	-	-	-	-	-	-
1,250	-	-	-	-	-	-

pH 8.1 HCL Effervescence None Other Tests —

Preliminary Bloating Test: Negative

Sample Number 15
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 20.9 Working Properties Plastic Color Brown
Drying Shrinkage, Percent 5.0 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	5 YR 6/8	3	5.0	19.4	34.4	1.77
1,050	5 YR 6/8	3	5.0	19.3	34.3	1.77
1,100	2.5 YR 6/6	4	7.5	16.7	30.6	1.83
1,150	2.5 YR 3/4	6	12.5	1.4	3.1	2.26
1,200	-	-	Melted	-	-	-
1,250	-	-	-	-	-	-

pH 7.8 HCL Effervescence None Other Tests —

Preliminary Bloating Test: Negative

Sample Number 21
Type Material: Clay
Raw Properties: Water of Plasticity, Percent 25.6 Working Properties Plastic Color Gray
Drying Shrinkage, Percent 5.0 Dry Strength Good
Slow Firing Test:

Temp. ° C	Munsell Color	Moh's Hardness	Percent Linear Shrinkage	Percent Absorption	Percent Apparent Porosity	Bulk Density gm/cc
1,000	2.5 Y 9/2	3	5.0	36.9	51.3	1.38
1,050	2.5 Y 9/2	3	5.0	36.8	51.0	1.39
1,100	2.5 Y 9/4	3	10.0	28.6	44.2	1.55
1,150	2.5 Y 8/4	4	17.5	11.5	23.6	2.05
1,200	-	-	Melted	-	-	-
1,250	-	-	-	-	-	-

pH 7.7 HCL Effervescence None Other Tests —

Preliminary Bloating Test: Negative

* Analyses performed at Bureau of Mines, Tuscaloosa Research Center, University, Alabama.

Table 4.--Oil and gas test wells in the vicinity of the Sand Dunes Wilderness Study Area, Wyoming

[MCFGPD, thousand cubic feet gas per day; bbls, barrels]

Number (see fig. 3)	Well name	Operator	Date completed	Collar elevation (feet)	Total depth (feet)	Production zone	Initial production
1	1-Z Grady-Federal	Davis Oil	01-11-71	6,858	7,997	----	drilled and abandoned[1/]
2	1-1	H. L. Brown, Jr.	01-03-84	7,591	N/A	----	----[2/]
3	44-24 Federal	Houston Oil and Minerals	11-22-80	7,070	10,730	Frontier (9,549-9,655 ft)	278 MCFGPD[1/]
4	1 Government-Dune	Kirby Royalties Inc.	11-14-63	7,043	5,500	----	drilled and abandoned[1/]
5	36-1 Trask-State	Rock Hill Industries	03-28-69	7,026	878	----	drilled and abandoned[1/]
6	1-35 Goldstein-Federal	Florida Exploration	03-25-81	7,019	10,130	Frontier (9,265-9,371 ft)	638 MCFGPD; 7 bbls. oil/day[2/]
7	1 Unit	Gulf Oil Corporation	12-01-55	6,936	10,066	----	drilled and abandoned[1/]
8	1 Jamieson A	Texas Oil and Gas	03-03-79	6,892	9,308	Frontier	show of gas[2/]
9	No. 1	Texas Oil and Gas	10-31-79	6,942	9,770	Frontier (8,656-8,806 ft) Muddy (9,346-9,355 ft)	8,000 MCFGPD[2/]

Table 4.--Oil and gas test wells in the vicinity of the Sand Dunes Wilderness Study Area, Wyoming--Continued

Number (see fig. 3)	Well name	Operator	Date completed	Collar elevation (feet)	Total depth (feet)	Production zone	Initial production
10	1 C & K-Federal	Texas Oil and Gas	11-07-80	6,810	9,550	----	drilled and abandoned[1/]
11	Sand Dunes-Federal	Texas Oil and Gas	10-09-80	6,876	9,554	Frontier (8,614-8,775 ft)	476 MCFGPD[1/]
12	11-10 Government-Amax	Sunset International Petroleum	04-01-67	6,816	9,585	2nd Frontier (8,656-8,756 ft)	300 MCFGPD; 1.7 bbls. distillate/day[1/]
13	1-12 Rogers	Amax Petroleum	11-23-65	6,892	9,017	Frontier (8,067-8,234 ft)	2,700 MCFGPD[1/]
14	7-13 Government	Terra Resources Inc.	08-09-73	6,876	8,400	Frontier (8,242-8,246 ft)	344 MCFGPD[1/]
15	1-23 Chilton-Federal	Amoco Production Co.	06-02-79	6,746	9,681	----	drilled and abandoned[2/]
16	1-15 Boars Tusk-Federal	Amoco Production Co.	suspended	6,816	10,400	----	drilled and abandoned[2/]
17	13-17 Federal-Essex	Husky Oil	06-04-79	6,714	3,300	----	drilled and abandoned[2/]

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